

In the Drawings

The attached sheet of drawings including Figs. 3(a)' to 3(c)' have been cancelled.

Attachment: Annotated Sheet

REMARKS/ARGUMENTS

Favorable reconsideration of this application as currently amended and in view of the following remarks is respectfully requested.

Claims 1, 3-8, 13-21, 23, 24, 26-29, and 39-46 are presently active in this case.

Claims 1, 13, 19, 21, and 28 have been amended, claim 2 has been cancelled, and claims 40-46 have been added by the present amendment. No new matter has been added. Regarding newly added claims 40 and 41 see Figs. 5(a)-(r), 6(a)-(l), and 8(a),(b). Regarding newly added claim 42, see the Specification beginning on page 16, line 1. Regarding newly added claims 43-46, see by way of example, original claim 13.

In the outstanding office action, Claims 1-8 and 39 were rejected under 35 USC 102(e) as being anticipated by Sakakima et al. (5,715,121); Claims 13, 15, 19, 21, 23, and 28 were rejected under 35 USC 103(a) as being unpatentable over Sakakima et al. in view of Carey et al. (6,686,068); claim 16 was rejected under 35 USC 103(a) as being unpatentable over Sakakima et al. in view of “AAPA” (Applicant’s Admitted Prior Art); claims 14, 20, 24, and 29 were rejected under 35 USC 103(a) as being unpatentable over Sakakima et al. in view of Carey et al. and Kamijo (6,819,532); claims 17 and 18 were rejected under 35 USC 103(a) as being unpatentable over Sakakima et al. in view of AAPA; and claims 26 and 27 were rejected under 35 USC 103(a) as being unpatentable over Sakakima et al. in view of Carey et al. and AAPA.

Applicants acknowledge with appreciation the courtesy of an interview granted to Applicant Fujiwara and Applicants’ representative on September 04, 2007. During the interview, the outstanding prior art rejections were discussed. In particular, the Examiner noted that applicants’ proposed change to claim 1 would overcome Figure 5 of Sakakima et al. In response thereto, Applicants have amended claim 1 as discussed during the interview.

The present invention (Claim 19 as amended) is also directed to a CPP spin valve element including a free layer structure; a pinned layer structure; and a thin non-magnetic current confining layer structure. The width of each of the confined current paths of the current confining layer structure is greater than  $t^{3/2}$  where  $t$  is the thickness of at least one of the free layer structure and the pinned layer measured in nanometers. By way of non-limiting example, Fig. 11 illustrates the ratio of the output  $\Delta V$  to the saturation value  $\Delta V_0$  mapped in the  $W_{CCP}$  -  $t_F$  space. Paragraph [0047] of the disclosure describes that to obtain a  $\Delta V / \Delta V_0$  value greater than  $\sim 0.8$  ( $\sim 80\%$ ),  $W_{CCP}$  can be set greater than  $t_F^{3/2}$  where  $W_{CCP}$  and  $t_F$  are measured in nm. When the separation between the multiple CCP's is not sufficiently large, then it is not expected that  $\Delta V / \Delta V_0$  will be greater than  $\sim 0.8$  ( $\sim 80\%$ ) even if  $W_{CCP} \geq t_F^{3/2}$ . However, it is clear that  $W_{CCP} \geq t_F^{3/2}$  results in greater output than  $W_{CCP} < t_F^{3/2}$ .

Similar to claim 19, Claim 28 defines a configuration including at least one current confining layer structure where the width of each of the confined current paths is the same width defined by Claim 19.

Regarding Carey et al., the official action asserts that the width of the spacer layer is 50 nm and the calculated thickness  $t$  of the conductive grains (i.e., the confined current paths) is about 39 nm when the conductive grains fill about 60 % of the spacer layer. As discussed during the interview, Carey et al. actually teaches that the maximum fill of the conductive grains is 50 %, not 60%. Further, during the interview, Applicants were asked to confirm regarding claim 19 which layer was being compared to the thickness of the confined current paths. In response, Applicants would like to point out that the thickness  $t$  recited in claim 19 regards the free layer or the pinned layer, not the CC-layer.

Additionally, Applicants have amended claims 19 and 28 to clarify that each of the current confined paths has a width greater than  $t^{3/2}$  where  $t$  is the thickness of at least one of the free layer structure and the pinned layer measured in nano-meters. In contrast thereto,

Carey et al. teach that the conductive grains 210 fill about 1 to 50% volume of the spacer layer. Carey et al. do not teach how many conductive grains are used when the fill is about 50%. However, it is suggested that at least two conductive grains are used in such a configuration. See the Figures of Sakakima et al. Consequently, adjusting the math applied by the office action, each of the conductive grains would have a width of about 25nm which is less than the  $(\text{thickness})^{3/2}$  of Sakakima et al. asserted in the office action -- 31.7 nm. For the foregoing reasons, Sakakima et al. are not believed to anticipate or render obvious the subject matter recited by claims 19 and 28 when considered alone or in combination with Carey et al.

Lastly, Claim 21 is directed to a CPP spin valve element including a free layer structure; a pinned layer structure; a first thin non-magnetic current confining layer structure; and a second current confining layer structure placed across at least one of the free layer and the pinned layer. The conducting parts of the CC layers are located in a cascade manner and at least an inner edge to edge distance of projections of each of the conducting parts of the CC layers forming at least one of the current paths through the free layer structure or the pinned layers onto the layer plane is made greater than a thickness of at least one of the free layer structure and the pinned layer. This configuration facilitates obtaining a high magnetoresistance.

Regarding Claim 21, the official action asserts that Carry et al. remedy the deficiency of Sakakima et al. However, the deficiency of Sakakima et al. is not expressly made. Thus, a *prima facie* case of obviousness has not been made. In particular, the official action asserts that Carry et al. teach a configuration where the width of the confined current paths of said CC-layer structure is 39 nm. For the reasons discussed above, Applicants respectfully traverse. Applicants point out that what the official action identifies as the size of the CC path is true if there is only one CC path in an element of 500 Å x 500 Å and the metal grains

grew a pillar with the same size from the bottom to the top of the layer. However, what affects the current confinement most is the size of the pillar contacting directly to the ferromagnetic layer. Therefore, the effective size of the pillar of such a metallic grain may be much smaller than the estimated value in the office action, as is shown schematically in Fig. 2 ~ Figs. 5 of Carry et al. Applicants further point out that Sakakima et al. fail to teach or suggest an embodiment where only CC path is used.

Consequently, Sakakima et al. are not believed to anticipate or render obvious the subject matter defined by Claim 21 even when considered in combination with Carry et al.

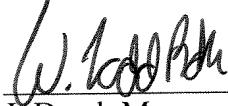
In view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore requested.

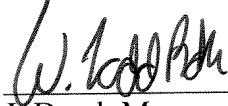
Respectfully submitted,

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